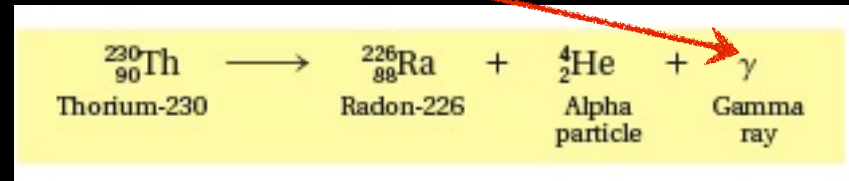


Table 25.1**Characteristics of Some Types of Radiation**

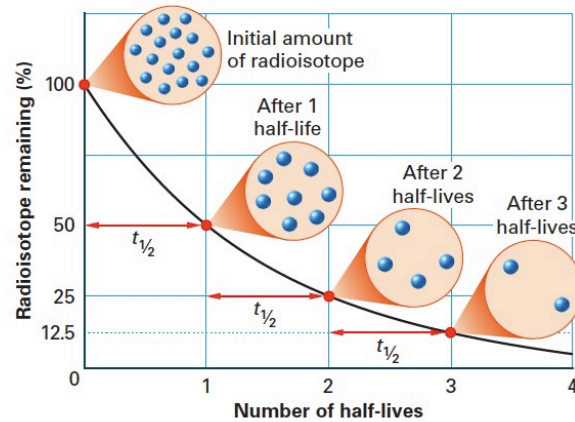
Property	Alpha radiation	Beta radiation	Gamma radiation
Composition	Alpha particle (helium nucleus)	Beta particle (electron)	High-energy electromagnetic radiation
Symbol	$\alpha, {}^4_2\text{He}$	$\beta, {}^0_{-1}\text{e}$	γ
Charge	2+	1−	0
Mass (amu)	4	1/1837	0
Common source	Radium-226	Carbon-14	Cobalt-60
Penetrating power	Low (0.05 mm body tissue)	Moderate (4 mm body tissue)	Very high (penetrates body easily)
Shielding	Paper, clothing	Metal foil	Lead, concrete (incompletely shields)

Remember, gamma radiation is not a particle.
Gamma radiation is notated by the Greek symbol for gamma.



Half-Life: The amount of time it takes for 1/2 (50%) of the original radioactive element to decay into its product.

Decay Curve for a Radioactive Element



If an element has a half-life of 10 years, how much time does it take for 87.5% of the element to decay?
87.5% decayed = 12.5% left over.

50% = 1 half-life
25% = 2 half-lives
12.5% = 3 half-lives
 $3 \times 10\text{yr} = 30\text{ yrs.}$

Table 25.3**Half-Lives and Radiation of Some Naturally Occurring Radioisotopes**

Isotope	Half-life	Radiation emitted
Carbon-14	5.73×10^3 years	β
Potassium-40	1.25×10^9 years	β, γ
Radon-222	3.8 days	α
Radium-226	1.6×10^3 years	α, γ
Thorium-234	24.1 days	β, γ
Uranium-235	7.0×10^8 years	α, γ
Uranium-238	4.46×10^9 years	α

This shows the nuclear transmutation of U-238 into Pb-206, which is stable.

